

REMARKS

Claims 1-20 are pending in this application. By this Amendment, claims 1, 2, 5 and 7 are amended as follows:

Claim 1 is amended to replace the brackets within formula (I) with parentheses;

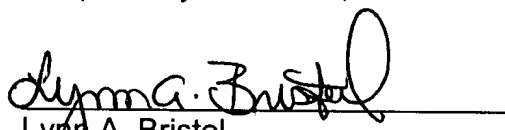
Claim 2 is amended to replace the brackets within formula (3) with parentheses, and to replace "(A¹O)" with -- (A²O)-- which finds antecedent support in the claim;

Claim 5 is amended to replace the brackets within formulas (1) and (3) with parentheses, and to insert -- (C₂H₂O) and (A²O)-- which finds antecedent basis in the claim; and

Claim 7 is amended to replace the brackets within formulas (1) and (3) with parentheses, and to insert -- (C₂H₂O) and (A²O)-- which finds antecedent basis in the claim.

Applicants submit that the foregoing amended claims now place this application into better condition for examination. No new matter is added.

Respectfully submitted,


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AMENDMENTS

IN THE SPECIFICATION:

A second assistant for digesting a lignocellulose material of the invention comprises a nonionic surfactant (B) obtained by addition of an alkylene oxide to an aliphatic alcohol, said nonionic surfactant (B) comprising one or more compounds represented by the general formula (3):



wherein R^5 is a straight-chain, branched or cyclic aliphatic hydrocarbyl group containing 4-24 carbon atoms; p is an addition molar number of 4-20; A^2 is an alkylene group containing 3 or 4 carbon atoms; and q is an addition molar number of 0 or 1-15; wherein (C_2H_4O) and $[(A^1O)] \underline{(A^2O)}$, in case of the average of q being 1-15, are linked random-wise and/or block-wise; said nonionic surfactant (B) having a weight-average molecular weight (M_w) and a number-average molecular weight (M_n) providing a ratio of M_w/M_n satisfying the relationship (4):

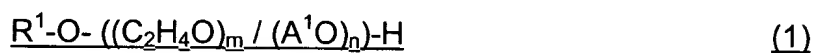
$$M_w/M_n \leq -0.183 \times K^{-0.930} \times \ln X + 1.327 \times K^{-0.065} \quad (4)$$

wherein $\ln X$ is a natural logarithm of X ; X is an average addition molar number of the alkylene oxide per 1 mole of the aliphatic alcohol; and K is the number of carbon atoms in R^5 of the general formula (3).

IN THE CLAIMS:

1. (Twice Amended) An assistant for digesting a lignocellulose material, which comprises a combination of:

(I) a nonionic surfactant (A) comprising one or more compounds represented by the general formula (1):



wherein R¹ is a branched alkyl group containing 4-24 carbon atoms represented by the general formula (2):



[(]wherein R² and R³ are independently selected from the group consisting of straight-chain or branched alkyl groups containing 1-21 carbon atoms, and R⁴ is an alkylene group containing 1-21 carbon atoms[)];

m is an integer of at least 1, having an average of 4-20;

A¹ is an alkylene group containing 3 or 4-carbon atoms; and

n is 0 or an integer of at least 1, having an average of 0-15; wherein (C₂H₄O) and (A¹O), in case of the average of n being 1-15, are linked random-wise and/or block-wise; with

(II) at least one selected from the group consisting of a quinone type digestion assistant and a polysulfide.

2. (Twice Amended) An assistant for digesting [for] a lignocellulose material, which comprises a combination of:

(I) a nonionic surfactant (B) obtained by addition of an alkylene oxide to an aliphatic alcohol, said nonionic surfactant (B) comprising one or more compounds represented by the general formula (3):



wherein R^5 is a straight-chain, branched or cyclic aliphatic hydrocarbyl group containing 4-24 carbon atoms;

p is an addition molar number of 4-20;

A^2 is an alkylene group containing 3 or 4 carbon atoms; and

q is an addition molar number of 0 or 1-15; wherein (C_2H_4O) and $[(A^1O)] (A^2O)$, in case of the average of q being 1-15, are linked random-wise and/or block-wise; said nonionic surfactant (B) having a weight-average molecular weight (M_w) and a number-average molecular weight (M_n) providing a ratio of M_w/M_n satisfying the relationship

$$M_w/M_n \leq -0.183 \times K^{-0.930} \times \ln X + 1.327 \times K^{-0.065} \quad (4)$$

wherein $\ln X$ is a natural logarithm of X ;

X is an average addition molar number of the alkylene oxide per 1 mole of the aliphatic alcohol; and

K is the number of carbon atoms in R^5 of the general formula (3); with

(II) at least one selected from the group consisting of a quinone type digestion assistant and a polysulfide.

5. (Twice Amended) An assistant for digesting a lignocellulose material, which comprises:

(a) at least one nonionic surfactant selected from the group consisting of a nonionic surfactant (A) and a nonionic surfactant (B) ; together with

(b) at least one anionic surfactant selected from the group consisting of an anionic surfactant (C), an anionic surfactant (D) and anionic surfactant (E);

in a weight ratio of 100/0.1 - 100/30;

said nonionic surfactant (A) comprising one or more compounds represented by the general formula (1); said nonionic surfactant (B) being obtained by addition of an alkylene oxide to an aliphatic alcohol and comprising one or more compounds represented by the general formula (3) and having a weight-average molecular weight (Mw) and a number-average molecular weight (Mn) providing a ratio of Mw/Mn satisfying the relationship (4); said anionic surfactant (C) comprising one or more compounds represented by the general formula (5); said anionic surfactant (D) comprising one or more compounds represented by the general formula (6); and said anionic surfactant (E) comprising one or more compounds represented by the general formula (7):





wherein R^1 is a branched alkyl group containing 4-24 carbon atoms represented by the general formula (2):



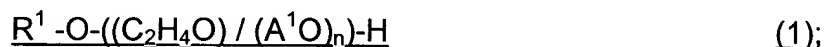
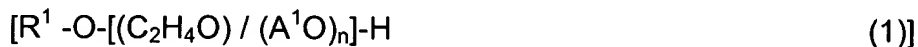
[()] wherein R^2 and R^3 are independently selected from the group consisting of straight-chain or branched alkyl groups containing 1-21 carbon atoms, and R^4 is an alkylene group containing 1-21 carbon atoms[]], R^5 and R^6 are straight-chain, branched or cyclic aliphatic hydrocarbyl groups containing 4-24 carbon atoms; R^7 is a straight-chain or branched alkyl group, alkenyl group, or mono- or di-hydroxyalkyl group, containing 4-24 carbon atoms; R^8 is an alkylene group containing 1-6 carbon atoms; m is an integer of at least 1, having an average of 4-20; p is a number of 4-20; A^1 , A^2 , A^3 and A^4 are alkylene groups containing 3 or 4 carbon atoms; n, r and s are 0 or an integer, of at least 1, having an average of 0-15; q is an addition molar number of 0 or 1-15; k is an integer of 1 or 2; M^1 , M^2 and M^3 monovalent cations; wherein (C_2H_4O) and (A^1O) , or (C_2H_4O) and (A^2O) , in case of the average of n or q being 1-15, are linked random-wise and/or block-wise;

$$Mw/Mn \leq -0.183xK^{-0.930} \times \ln X + 1.327xK^{-0.065} \quad (4)$$

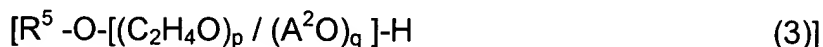
wherein $\ln X$ is a natural logarithm of X; X is an average addition molar number of the alkylene oxide per 1 mole of the aliphatic alcohol; and K is the number of carbon atoms in R^5 of the general formula (3).

7. (Twice Amended) A method for producing a pulp, which comprises digesting a lignocellulose material with an alkali or a sulfite in the presence of a digestion assistant; said assistant comprising at least one assistant (I) selected from the group consisting of:

(A) a nonionic surfactant comprising one or more compounds represented by the general formula (1):



(B) a nonionic surfactant, obtained by addition of an alkylene oxide to an aliphatic alcohol, comprising one or more compounds represented by the general formula (3):



and having a weight-average molecular weight (Mw) and a number-average molecular weight (Mn) providing a ratio of Mw/Mn satisfying the relationship (4);

$$Mw/Mn \leq -0.183xK^{-0.930} \times \ln X + 1.327xK^{-0.065} \quad (4);$$

(C) an anionic surfactant comprising one or more compounds represented by the general formula (5):



(D) an anionic surfactant comprising one or more compounds represented by the general formula (6):



wherein R¹ is a branched alkyl group containing 4-24 carbon atoms represented by the general formula (2):



wherein R² and R³ are independently selected from the group consisting of straight-chain or branched alkyl groups containing 1-21 carbon atoms, and R⁴ is an alkylene group containing 1-21 carbon atoms[]; R⁵ and R⁶ are straight-chain, branched or cyclic aliphatic hydrocarbyl groups containing 4-24 carbon atoms; m is an integer of at least 1, having an average of 4-20; p is a number of 4-20; A¹, A² and A³ are alkylene groups containing 3 or 4 carbon atoms; n and r are 0 or an integer of at least 1, having an average of 0-15; q is an addition molar number of 0 or 1-15; k is an integer of 1 or 2; M¹ and M² are monovalent cations wherein (C₂H₄O) and (A¹O), or (C₂H₄O) and (A²O), in case of the average of n or q being 1-15, are linked random-wise and/or block-wise; LnX is a natural logarithm of X; X is an average addition molar number or the alkylene oxide per 1 mole of the aliphatic alcohol; and K is the number of carbon atoms in R⁵ of the general formula (3).